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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/943,131	08/31/2001	Julian Norley	P-1048	9247

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EXAMINER

BAHTA, ABRAHAM

ART UNIT	PAPER NUMBER
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1775

DATE MAILED: 04/22/2003

7

Please find below and/or attached an Office communication concerning this application or proceeding.

AG-7

Office Action Summary

Application No.

09/943,131

Applicant(s)

NORLEY ET AL.

Examiner

Abraham Bahta

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 January 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Shane '061.

Shane teaches a laminated graphite sheet in which the sheet of material may be impregnated with various amounts of polymeric material such as an epoxy resin. See col. 14, line - col. 15, line 11 and col. 13, lines 59-66. The graphite material may be compressed at elevated temperature of up to 1000 °C. See col. 11, lines 22-40. Further, a heat curable impregnant or binder such as phenolic resin may be utilized. See col. 13, lines 66-74.

Shane does not require a resin content less than 30% by weight; however, since Shane discloses the resin content may be about 30% by weight and that the flexible graphite sheet may be impregnated with various amounts of polymeric material, (see col. 7, lines 17-21 and col. 13, lines 59-74) it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the content of the resin in order to manufacture a laminated graphite sheet having the desired characteristics such as mechanical strength, thermal conductivity, degree of anisotropy, density and thickness depending on the ultimate use of the product. In addition, it has

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been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Concerning claims 4-5, Shane does not require a pressure of from 1000 psi to 5000 psi; however, the reference at col. 4, lines 60-62 suggests the density and thickness of the sheet material can be varied by controlling the degree of compression.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to employ the desired pressure and temperature to the graphite sheet material in order to obtain the desired thickness and density as taught by Shane.

Claim Rejections - 35 USC § 103

Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shane et al '061.

Shane teaches a laminated graphite sheet in which the sheet of material may be impregnated with various amounts of polymeric material such as an epoxy resin. See col. 14, line - col. 15, line 11 and col. 13, lines 59-66. The graphite material may be compressed at elevated temperature of up to 1000°C. See col. 11, lines 22-40. Further, Shane teaches the laminated graphite sheet may include non-graphite materials such as aluminum and copper. See col. 5, lines 7-16. Further, a heat curable impregnant or binder such as phenolic resin may be utilized. See col. 13, lines 66-74.

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Shane does not require a resin content less than 30% by weight; however, since Shane discloses the resin content may be about 30% by weight and that the flexible graphite sheet may be impregnated with various amounts of polymeric material, (see col. 7, lines 17-21 and col. 13, lines 59-74) it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the content of the resin in order to manufacture a laminated graphite sheet having the desired characteristics.

Regarding claim 9, Shane does not require a temperature of below 200°C and a pressure of below about 5000 psi; however, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to vary the temperature and pressure in order to achieve a flexible graphite sheet material having the desired surface properties including density, mechanical strength, thermal conductivity, degree anisotropy depending on the ultimate use of the product.

Claim Rejections - 35 USC § 103

Claims 10-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shane et al '061.

Shane teaches a laminated graphite sheet in which the sheet of material may be impregnated with various amounts of polymeric material such as an epoxy resin. See col. 14, line - col. 15, line 11 and col. 13, lines 59-66. The graphite material may be compressed at elevated temperature of up to 1000°C. See col. 11, lines 22-40. Further, Shane teaches the laminated graphite sheet may include non-graphite materials such as aluminum and copper. See col. 5, lines 7-16. Further, a heat curable impregnant or binder such as phenolic resin may be utilized. See col.

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13, lines 66-74. In addition, the reference teaches the graphite sheet material may possess or exhibit thermal conductivity, thermal insulating properties and anisotropic electrical properties. See col. 13, lines 16-26.

Shane does not require a resin content less than 30% by weight; however, since Shane discloses the resin content may be about 30% by weight and that the flexible graphite sheet may be impregnated with various amounts of polymeric material, (see col. 7, lines 17-21 and col. 13, lines 59-74) it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the content of the resin in order to manufacture a laminated graphite sheet having the desired characteristics such as thermal conductivity, density, mechanical strength, degree of anisotropy depending on the ultimate use of the product. In addition, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Concerning claims 11-16, Shane does not require a pressure of 1000 to 5000 psi; however, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to vary the temperature and pressure in order to achieve the desired thickness and density.

Regarding claims 12-13, Shane does not require a thermal conductivity greater than 100 W/mC; however, Shane teaches the thermal conductivity of the graphite sheet material in "a" direction may be in the range of 140-150 Btu. See col. 13, lines 16-24. It would have been obvious to one of ordinary skill in the art at the time the invention was made to vary the curing

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temperature and pressure in order to achieve the desired thermal conductivity, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable range involves only routine skill in the art.

Regarding claim 14, the reference does not require the specific density recited in claim 14, however, the reference at col. 4, lines 60-62 suggests the density and thickness of the sheet material can be varied by controlling the degree of compression.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to employ the desired pressure to the graphite sheet of material in order to obtain the desired thickness and density as taught by Shane.

Regarding claim 15-16, the reference does not require a resin content of 3% to about 35% by weight; however, the reference at col. 10, lines 23-27 suggests the graphite sheet of material may be impregnated with suitable impregnant or additives such as epoxy resin of about 30% by weight. See col. 7, lines 17-18. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to employ the desired content of a resin in order to modify the nature or properties of the graphite sheet material depending on the final use of the product.

Claim Rejections - 35 USC § 103

Claims 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shane et al '061.

Shane teaches a resin impregnated flexible graphite sheet material wherein the sheet of material possesses anisotropic electrical, thermal insulating and thermal conductivity properties.

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See col. 13, lines 16-30. The resin may be epoxy resin. See col., lines 56-74.

Shane does not require thermal conductivity of greater than about 300 W/mC and a thermal conductivity of less than about 10 W/mC in an in plane direction and in an out of plane direction respectively; however, Shane in several embodiments suggests the graphite sheet material may be modified to achieve the desired properties of the material. For example, Shane discloses the density and thickness of the sheet material can be varied by controlling the degree of compression (col. 4, lines 6-62); the degree of anisotropy may be increased with increasing density (col. 4, lines 66-69); impregnants or additives such as metal powder, clay, organic polymeric materials and the like can be incorporated or mixed with the graphite composition to form the desired sheet material (col. 5, lines 1-6); the temperature in which the graphite material is cured may be varied to modify the graphite sheet material (col. 11, lines 22-26) and the graphite sheet material may be modified to possess either low or high thermal conductivity (col. 13, lines 9-10).

Given the above teaching, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the graphite sheet material to possess the desired thermal conductivity depending on the ultimate use of the product.

Shane does not require a resin content less than 30% by weight; however, since Shane discloses the resin content may be about 30% by weight and that the flexible graphite sheet may be impregnated with various amounts of polymeric material, (see col. 7, lines 17-21 and col. 13, lines 59-74) it would have been obvious to one of ordinary skill in the art at the time of the

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invention to vary the content of the resin in order to manufacture a laminated graphite sheet having the desired characteristics. In addition, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Regarding claim 19, the reference does not require the specific density recited in claim 19, however, the reference at col. 4, lines 60-62 suggests the density and thickness of the sheet material can be varied by controlling the degree of compression.

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to employ the desired pressure to the graphite sheet of material in order to obtain the desired thickness and density as taught by Shane.

Response to Applicant's arguments

The applicant contends that since the claims 1, 6, 10 and 17 are amended to include "a resin content of at least of the said flexible graphite sheet comprises a sufficient amount and said laminate/device is dense and cohesive but said resin content comprises less than 30% by weight" and argues the above limitation recited in said claims is not taught by the reference. The Examiner contends, as discussed above, Shane does not require a resin content less than 30% by weight; however, since Shane discloses the resin content may be about 30% by weight and that the flexible graphite sheet may be impregnated with various amounts of polymeric material, (see col. 7, lines 17-21 and col. 13, lines 59-74) it would have been obvious to one of ordinary skill in the art at the time of the invention to vary the content of the resin in order to manufacture a laminated graphite sheet having the desired characteristics such as thermal conductivity, density, mechanical

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strength, degree of anisotropy depending on the ultimate use of the product. In addition, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

With respect to claim 17, the applicant argues the resin-impregnates sheets of flexible graphite has an in-plane thermal conductivity of greater than 300 W/mC and states that GRAFOIL Engineering Design Maul (pages 11 and 17 of volume one) reports that the in-plane thermal conductivity is 140 W/mC. The applicant further, contends that the inventive flexible graphite sheet of the present claimed invention has an in-plane thermal conductivity of over twice as great as that of the flexible graphite sheet provided by the assignee of the Shane et al reference. The Examiner contends, although Shane does not require thermal conductivity of greater than about 300 W/mC and a thermal conductivity of less than about 10 W/mC in an in plane direction and in an out of plane direction respectively; Shane in several embodiments suggests the graphite sheet material may be modified to achieve the desired properties of the material. For example, Shane discloses the density and thickness of the sheet material can be varied by controlling the degree of compression (col. 4, lines 6-62); the degree of anisotropy may be increased with increasing density (col. 4, lines 66-69); impregnants or additives such as metal powder, clay, organic polymeric materials and the like can be incorporated or mixed with the graphite composition to form the desired sheet material (col. 5, lines 1-6); the temperature in which the graphite material is cured may be varied to modify the graphite sheet material (col. 11, lines 22-26) and the graphite sheet material may be modified to possess either low or high thermal

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conductivity (col. 13, lines 9-10) and the flexible graphite sheet may be impregnated by various of amounts of polymeric material. See col. 13, lines 59-74.

Further, the applicant argues in table II of the Shane reference the tensile strength of the graphite sheet is reported as 450 to 3200 psi and that the mechanical strength/flexural strength (tensile strength) of the present claimed invention is 8000 psi as shown in example 1 and contends that the tensile strength of the inventive resin-impregnated flexible graphite sheet is at least twice as great as that of the reference. In response to applicant's argument the Examiner contends the claims of the present invention do not recite flexural strength or tensile strength, thus, these limitations have not been claimed. Similarly, the applicant states the Young' Modules of the present claimed invention is 7.5×10^6 ; however, the Examiner notes this limitation has not been claimed.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CAR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CAR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however,

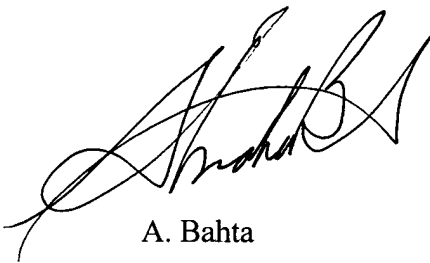
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will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication should be directed to Abraham Bahta at telephone number (703) 308-4412. The Examiner can normally be reached Monday-Friday from 11:30 AM -8:00 PM (EST).

If attempts to reach the Examiner by telephone are unsuccessful, the examiner's supervisor Deborah, Jones, can be reached on (703) 308-3822.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.



A. Bahta

04/08/03


DEBORAH JONES
SUPERVISORY PATENT EXAMINER